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Intelligence Memorandum

An Assessment of the US Bombing

and Mining Campaign in North Vietnam

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TS-203097/72-B
22 August 1972,

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CENTRAL INTELLIGENCE AGENCY
August 1972

INTELLIGENCE MEMORANDUM

AN ASSESSMENT
OF THE US BOMBING AND MINING CAMPAIGN
IN NORTH VIETNAM

Introduction

This memorandum evaluates the US bombing and mining program as it has developed since 10 May. As requested, it addresses two fundamental questions related to the current operations. First, is the program soundly conceived, given what we know of North Vietnamese resiliency during the Rolling Thunder Program (1965-68); second, are the program's objectives likely to be met, in light of the current status of North Vietnam's transportation system and economy?

Summary and Conclusions

A. The current US bombing campaign, Operation Linebacker, has been both better conceived and better implemented than was the Rolling Thunder campaign. The relatively greater freedom given field commanders in the day-to-day effort gives those responsible for Linebacker's actual execution a degree of flexibility which they did not have during Rolling Thunder. The improved technology, most notably the wide employment of the highly accurate "smart" bombs, often has made it possible to destroy with one strike a target that during Rolling Thunder required many strikes using conventional aiming devices. Moreover, the current program, once initiated, has concentrated heavily on the major target systems -- again in contrast to Rolling Thunder, when many of North Vietnam's major facilities, especially in the industrial sector, were off limits until late in the campaign.

B. The current targeting also has certain significant strong points, especially when compared to targeting in the 1965-68 program. Linebacker is generally restricted to those targets related to North Vietnam's war-supportive capability and seems generally in concert with sound targeting practices. In addition, the entire aerial campaign has benefited from the mining of North Vietnam's major ports and harbors, which has placed an unprecedented strain on North Vietnam's economy and transport system.

C. In a relatively short time, the current campaign has produced some noteworthy successes. The strikes on North Vietnam's overland transport system have produced extensive disruptions to both commercial and civilian military activity and forced North Vietnam to divert substantial amounts of manpower. Air operations during the past few months also have destroyed much of Hanoi's modern economy. Painstakingly rebuilt during the past few years, its destruction undoubtedly has been of great concern to the North Vietnamese leadership. For the second time within the last decade, North Vietnam has been forced to postpone economic development and its population compelled to make great sacrifices.

D. Although Linebacker has benefited from several major improvements, it is still faced with some of the impediments which hampered the former campaign. North Vietnam's economy remains a simple one which contributes little to Hanoi's war effort. Hence, even the destruction of the modern industrial sector has had little effect on North Vietnam's war-making capability. By far, imports represent Hanoi's major source of supplies for the war effort, and the tonnage requirements for military supplies in relation to total imports is quite small. Moreover, North Vietnam possesses a highly diversified, time-tested transportation system which has repeatedly shown itself resistant to interdiction.

E. Some of the target systems taken under attack have probably already been neutralized to the maximum extent feasible or were marginal target systems to begin with. Examples of systems now neutralized to the maximum feasible extent are the modern industrial facilities, which have been destroyed and can only be rebuilt over extended

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periods of time. These would include Hanoi's main electric power stations and the principal petroleum depots. Examples of marginal target systems include the military supply and dispersed storage facilities and transportation repair facilities. Attacks on these targets -- with the possible exception of the initial attacks on the larger facilities -- are likely to yield low returns, and these targets, by their very nature, will be difficult to keep interdicted.

F. As Linebacker continues, its efforts will almost certainly concentrate on the surface transportation systems and moving targets associated with logistic activities. The most profitable of these targets are the major import-carrying rail lines; the petroleum pipeline systems, and the large inventories of transport equipment.

G. These are all difficult targets to interdict, and the results to be expected from interdiction efforts directed against them are extremely sensitive to both the intensity of the attacks and the areas over which they are carried out. Most of these targets are concentrated in those parts of North Vietnam north of the 20th parallel -- an area which has accounted for only about 25% of the attack effort to date. Some 75% of the strike effort thus far has been south of the 20th parallel, an area in which the pertinent target system is extremely low-profile and so widely dispersed that the likelihood of inflicting significant damage to the logistic system is diminished greatly.

H. Finally, it should be noted that the scale of Operation Linebacker -- the number of sorties per day presently being flown -- is simply not enough to achieve true interdiction, as opposed to severe harassment. If the scale is to remain unchanged, a greater concentration of the present effort on the more lucrative targets (e.g., the transportation network to the north of the 20th parallel) would almost certainly lead to some improvement in the effectiveness of Operation Linebacker. Even then, however, the task of interdicting North Vietnam's transportation system is such a mammoth one that the current level of sorties cannot be expected to reduce the capacity of the system to a level at which it could no longer support the war.

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Discussion

1. There has unquestionably been a major improvement in the bombing procedures and targeting employed in the current bombing program (Operation Linebacker) compared with those employed in the 1965-68 bombing campaign (Rolling Thunder). During the 1965-68 period, air attacks were fragmented on a variety of military and economic target systems. Field commanders operated under ground rules which were highly restrictive and not always easy to follow. Contrastingly, in the current campaign, field commanders have been given a much greater freedom in day-to-day operations and do not appear to be nearly as confined by restrictions as was the case during Rolling Thunder. Moreover, the current campaign has benefited immensely from improved technology, especially the employment of the so-called "smart" bomb. Targets which often required many strikes to destroy with conventional bombs during Rolling Thunder have in many cases been destroyed by a single strike in the present campaign. Finally, the mining of the ports and harbors of North Vietnam simultaneously with the intensive aerial interdiction represents the greatest and most significant difference with the former campaign.

North Vietnam as a Target

2. Nevertheless, the current program still operates under significant handicaps. North Vietnam is far from an ideal setting for a successful strategic bombing program.

3. First, except for its manpower and agricultural production, North Vietnam's own economy makes only a minimum contribution to the support of military operations. North Vietnamese industry has only a very limited ability to produce military equipment. All heavy military hardware, as well as most small arms, ammunition, and petroleum, must be imported from Communist countries.

4. Second, the internal transportation system is, for a variety of reasons, relatively invulnerable to complete interdiction. When the US bombing commenced in 1965, North Vietnam already had a

road, rail, and waterway system which was more than adequate for its military and economic requirements. During the following years, the system was continually repaired and its redundancy enhanced by the building of new roads paralleling the old ones and a myriad of fords, ferries, and bridges at points vulnerable to attack. The tonnages that must move over the North Vietnamese transport system are small compared to the overall capacity of the system, and any bombing campaign directed at stopping the flow is caught up in a situation where diminishing returns from the effort expended set in very quickly.

5. Third, North Vietnam's economy is essentially agrarian. Its industries are generally simple and small-scale. This can be seen in the following tabulation, which shows the relative contributions of various sectors to national output.

<u>Economic Sector</u>	<u>Percent of National Output</u>
Agriculture	<u>50</u>
Industry	<u>25</u>
Central (modern)	10
Local and handicrafts	15
Construction	<u>5</u>
Commerce, transportation, and communications	<u>20</u>
Total	<u>100</u>

Such an economy has substantial resiliency and capacity to resist economic collapse and requires comparatively few sophisticated inputs from domestic industry or from abroad to sustain production levels.

6. Finally, any bombing campaign directed at denying war materiel to the front lines is faced with the fact that there is in existence a multitude of widely dispersed -- and generally highly secure -- storage areas in North Vietnam and along the enemy's supply corridors in southern Laos and northeastern Cambodia.

7. All of the above factors must be considered in judging the effectiveness of the current US effort. A related question is whether or not the selection of targets has followed rational principles. In the following paragraphs we discuss briefly some of the basic principles of target selection. Thereafter we consider how effectively these principles have been applied in the case of Operation Linebacker.

Use Pattern

8. This factor in target selection covers the extent to which a particular target really contributes to military output or to military operations, to civilian uses, to export, and so forth. A highly developed country, such as World War II Germany, presents a large number of interrelated industrial targets which all contribute to the nation's war-making potential. While it may prove impossible to find a particular "bottleneck" industry, there are many lucrative targets which, if destroyed, will make it difficult for the nation in question to produce the war materiel it needs. The simple economy of North Vietnam, on the other hand, does not present the same opportunities. Since almost all war materiel is imported, the targets which are most directly related to the country's war-making potential are the transportation systems. The destruction of the nation's modern industry obviously brings added pressure to bear on Hanoi's decision-makers, but it does not physically prevent them from continuing the war if they decide to do so.

The "Delay Factor"

9. This factor concerns the travel time of any war equipment or materiel from the point of manufacture to the frontlines and the degree to which bombing can delay the onward movement of goods. If one assumes, in the case of North Vietnam, the "point of manufacture" for war-related materiel (in this case, all imported) to be North Vietnam's overland and maritime entry points, then the question can be raised whether the greatest possible delays in receipt of military goods at the front are being considered in the target selection process.

Cushion

10. This factor includes a variety of considerations, such as the extent to which preattack consumption must be cut back before essential requirements are affected: the extent to which the enemy can employ substitute commodities; the size of stocks; goods in the pipeline; and the like. The most important factor with respect to cushion is the determination of the so-called "critical point" -- which is the point to which the output of the target industry or service may be reduced without serious effect. Below the critical point, the effects begin to be felt with increasing impact.

Target Vulnerability

11. This factor covers the appraisal of the physical vulnerability of a potential target system to attack by existing military means. The size of weaponry available and needed, the level of bombing accuracy which is achievable, the physical hardness of the target, and other pertinent considerations enter into this calculation.

Recuperability

12. This factor covers both the time and size of effort needed to repair or replace the essential parts of a damaged target system.

The Principle of Concentration

13. This factor is of overriding importance in attacks on either tactical or strategic target systems. The principle of concentration fixes attention on two primary factors:

- a. The necessity of attacking all, or the major part, of any target system in order to cut through the cushion.
- b. The necessity of concentrating the attack in point of time to overwhelm the ability to reconstruct, repair, or disperse.

The Current Program

Introduction

14. In most respects, target selection in the current program appears to have been sound. (The exceptions will be discussed in detail in the sections which follow.) There has not been, for example, a proliferation of strikes against unessential -- or marginally essential -- economic targets. Furthermore, the targets which have been selected have been matched -- thanks, in substantial part, to the "smart" bomb -- with appropriate strike action to a far greater degree than during the 1965-68 period. Finally, the program itself has been carried out in a much more concentrated fashion than that of 1965-68. It was not until the former bombing program was in its 23rd week that attack sorties exceeded 1,000 per week, and only twice in 1965 did sorties reach the current average of 1,500 per week.*

Transportation Targets

15. Operations against the North Vietnamese transportation system to date have effectively

* We note, however, that the current level of air interdiction -- an average of about 210 attack sorties a day -- is substantially below the level of some 470 attack sorties a day achieved at the height of the Rolling Thunder program.

25X1D disrupted rail traffic throughout the country and limited operations to shuttle service, but they have had little permanent effect on highways or waterways. Although large numbers of bridges and transshipment areas associated with these modes have been attacked, traffic has been able to continue using alternate routes and bypasses. COMINT, pilot reports, and photography continue to reveal evidence of highway and waterway traffic along most routes in North Vietnam, and, in some cases, pilots have indicated that traffic is "heavy" and that "numerous" trucks or watercraft are involved. The evidence [REDACTED] of increased activity in the Chinese rail yard at P'ing-hsiang (which feeds the North Vietnamese system) indicates that a large-scale truck transport effort is under way. Much of this activity takes place at night when both air attacks and reconnaissance missions are limited.

Disrupting the Rail Lines

16. This bombing objective is to disrupt the rail system sufficiently to render shuttling around the railroad cuts too expensive and repair too difficult to sustain substantial rail traffic.

17. In relation to this objective, none of the targets presently being struck are "unnecessary," although several are more important than others. Thus, the destruction of the Hanoi Railroad/Highway (Doumer) Bridge over the Red River and the Hanoi Railroad/Highway Bridge over the Canal des Rapides ties up more traffic and is more costly than the destruction of several smaller bridges or attacks against the Hanoi-Lao Cai line.

18. Several strikes have been directed against the Hon Gay-Kep and Hanoi-Lao Cai lines -- both secondary routes -- while the more important and lucrative targets on the Dong Dang line -- the main overland import route -- have not in all cases been restructed immediately and have been allowed to be reconstructed.

19. Attacks on railroad/highway bridges have been extremely effective during the current program. In most cases, only the initial strike has been needed to knock out a bridge, unlike during Rolling

Thunder when it often was necessary to hit a bridge repeatedly with large numbers of sorties before inflicting significant damage. A good example of this increased efficiency of Linebacker occurred on 11 June on the Dong Dang railroad line at Lang Giai and Lang Dang -- about 15 to 20 miles from China -- when a total of six bridges were hit and reported destroyed using only 20 MK-82 bombs. By comparison, during Rolling Thunder, a 1967 study of bombing effectiveness against 48 major bridges revealed that an average of only one bomb out of 47 hit a target and that an average of six sorties were required to interdict one bridge.

20. An "entirely effective" bombing campaign against a railroad system would mean the complete stopping of all rail transport operations. While a bombing program can interdict the system, force shuttling operations, and make the transport of goods more costly to the enemy, it cannot entirely stop traffic, since some limited amounts of goods could be shuttled between interdictions. Shuttling, for example, appears to be under way on the Dong Dang, Thai Nguyen, and Lao Cai lines despite the repeated interdictions.

21. Along with "disrupting" the system, another objective of the present campaign is to render repair too expensive. There is no way to judge what Hanoi's current tolerance is for such rebuilding activity, but during Rolling Thunder, repeated strikes against bridges were counteracted by extensive repair activities or the use of bypasses. Engineering troops and conscripted local workers responsible for preassigned targets frequently arrived at the bombed areas within one to three hours after a strike. At the height of the Rolling Thunder program, for example, there were 326 strikes against 52 JCS-targeted bridges, and the maximum repair times seldom extended more than a month and were occasionally just a few days. On the Hanoi-Dong Dang line, seven bridges were destroyed or damaged, and as a result, a total of 25 bypasses were built.

22. While it is undoubtedly impossible to halt rail traffic altogether, and while it would be exceedingly difficult -- to judge from historical experience -- to escalate the cost of countermeasures

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to a point which Hanoi could not support, there are some improvements in the present program which might be made. The program, for example, could be improved by concentrating systematic and repetitious attacks against targets on the Dong Dang and Thai Nguyen lines, which have been used to shuttle goods into North Vietnam.

23. An increase in the level of sorties directed against primary targets would proportionately increase the campaign's disruptive effects. During Rolling Thunder, it was estimated that sustained interdiction of the land transport in the north -- principally directed at stopping through traffic on the major rail lines -- would require 3,000 sorties a month. Even granting the increased efficiency of the current program, there has been a relatively low level of strikes against the railroad and railroad/highway bridges in the north -- only about 100 attack sorties have been flown against these targets, compared to 200 against considerably less important bridges in the south.

Destroying Rolling Stock

24. One objective of the current campaign apparently has been to go after rolling stock by targeting rail yards and sidings and increasing the use of armed reconnaissance to seek out such targets of opportunity.

25. US bombing of rail lines in North Vietnam has effectively stopped through rail service. As a result, rolling stock has accumulated along rail segments and at the larger rail yards. Some of the more important rail yards -- where sizable accumulations of rolling stock can be anticipated -- are Thanh Hoa and Vinh. Secondary yards such as Hon Gay, Khe Se, and Uong Bi do not represent significant targets and are far less lucrative than those on the main Hanoi-Dong Dang line. Attacks against the larger rail yards will disrupt operations and result in an appreciable destruction of stockpiled supplies, but for these attacks to make a serious impact they will have to be frequent and repetitive.

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26. Even then, Hanoi may successfully counter attacks on its inventory of rolling stock if its allies maintain deliveries of replacement stock. During 1965-68, although the total volume of transport equipment reported destroyed and damaged was impressive (33 locomotives and 2,320 railroad cars destroyed), the net impact of these losses on North Vietnam's transport capability was far from crippling. In fact, the railroad rolling stock inventory remained at the prebombing level. Thus far, 337 to 367 units of railroad equipment of all types have been reported destroyed, a fairly impressive total, when considered in the abstract, but actually only a small dent in North Vietnam's inventory.

Reducing the Use of Highways

27. This objective -- to reduce highway traffic and force trucks onto lesser capacity roads -- is perhaps the most difficult of all to attain. Heavy bombing against the highway system during Rolling Thunder failed to halt the flow of goods into and through the country.* The intervening years since

* A similar failure of bombing was graphically illustrated in southern Laos during the 1968/69 dry season. An intensive round-the-clock air interdiction campaign was carried out to reduce the flow of supplies into southern Laos and South Vietnam along the Ho Chi Minh Trail. This effort emphasized attacks against "chokepoints" -- river fords and road intersections chosen on the basis of their relative vulnerability to attack, difficulties in repairing them, and the lack of available bypass facilities. The bombing itself employed a variety of ordnance delivered by the same types of aircraft presently being used against similar targets in North Vietnam. Twice as many attack sorties were flown during the November 1968-April 1969 period in Laos as is currently the case in North Vietnam. The 425 sorties per day in Laos compares with the average of about 210 during the current Linebacker program in North Vietnam.

Even under this level of air interdiction, more tonnage moved through Laos than in any previous season, and resupply continued at an intensive pace during December-February, the months of peak bombing effort against the major chokepoints.

Rolling Thunder have permitted the North Vietnamese to upgrade their vehicle transport system by importing more and better trucks and road construction equipment and by stockpiling pontoon bridge sections and other maintenance equipment.

28. Cumulative Linebacker operations against the North Vietnamese transportation system to date have had no lasting effect on highways. There have been many reports of large volumes of truck traffic moving south from the PRC.

29. The road system of northern North Vietnam (i.e., above the 20th parallel) is a far more lucrative target than that of the Panhandle. Below the 20th parallel, the road network is more dispersed and the volume of supplies moving over it is smaller. Despite these facts, only 54 highway bridges in northern North Vietnam have been struck under Operation Linebacker, while over 1,000 have been struck in the Panhandle. It should be noted, however, that even to the north of the 20th parallel the North Vietnamese road network is a low-density target system and is highly redundant and well-constructed. Even with a major increase of the bombing in this area, the prospects of reducing highway traffic to below critical levels are not very bright.

Truck Attrition

30. Attacks for the purpose of attaining this goal have been directed at both truck parks and against trucks on the move in hopes of bringing the remaining truck resources to the point of breakdown.

31. The objective is an ambitious one in view of the fact that the North Vietnamese inventory prior to the bombing program was between 18,000 and 23,000 vehicles and is continually being fed with trucks from the USSR and PRC. While upwards of 10,000 of the total inventory are in the Hanoi/Haiphong and Dong Dang areas, only a relatively small share of the total is concentrated in truck parks. Strikes against the truck parks (particularly against that at Dong Dang) might well bring several thousand trucks under attack. But it would be optimistic to anticipate that a majority of the

trucks would be destroyed in such attacks. Of the some 6,400 trucks reported to have been sighted by pilots thus far in the campaign, only about 900 have been reported destroyed and 600 damaged.* From the point of view of cost-effectiveness, attacks against the parks offer the best means of destroying trucks. Thus far during the current bombing program, truck "kills" resulting from armed reconnaissance attacks have averaged about one truck per 22 sorties (directed at all types of targets). During Rolling Thunder in 1967, the ratio was 34 sorties to one truck kill. The truck kill performance reported in southern Laos this past season was considerably better -- seven sorties to one truck -- due to the concentration on this type of target and, most importantly, to the use of gunships, which have been a very successful weapon against trucks (though highly vulnerable to a surface-to-air missile or antiaircraft artillery threat).

32. During the next couple of months, through September, North Vietnam must endure the wet monsoon season, which traditionally causes extensive flooding and seriously restricts overland travel. During this period, secondary and some primary roads become unusable, and makeshift bridge and ferry facilities bypassing the many downed permanent structures become hazardous to use or inoperable because of high water and swift currents. Thus, truck traffic must be funneled over a much smaller net of serviceable highways, and many key crossings become bottlenecks.

33. If a concentrated program were carried out against trucks in the next six weeks, programming many nights flights and possibly even using gunships along the PRC-North Vietnam border, it is likely that the total truck kills will increase markedly. However, even if it were theoretically possible to seek out and destroy the majority of the trucks

* Such reporting, based on sightings by pilots during the heat of combat, carried a built-in risk of exaggeration. The Washington intelligence community, for its accounting purposes, has developed a formulation "effective truck losses" which includes 75% of all trucks reported destroyed and 25% of all trucks reported damaged.

currently in the inventory, imports from Hanoi's allies would prevent truck resources from reaching the "point of breakdown." Furthermore, the narrowing of the program to trucks would mean the sacrifice of other targets -- for example, bridges, which represent a higher replacement cost to the enemy.

Denying Access of International Shipping

34. This objective depends on the success of the mining program and on certain surface/air actions. Our observations will be confined to the mining program as we have observed it thus far.

35. Since mine activation on 12 May, the major North Vietnamese deep-water ports of Haiphong, Cam Pha, and Hon Gay have been effectively sealed off. Since that date, no significant seaborne imports have entered North Vietnam through these harbors.

36. The impact of the mining program elsewhere along the North Vietnamese coastline is less certain. There are definite signs of leakage at such places as the Hon Nieu anchorage serving Vinh and at Hon La Island 75 miles to the south. Both areas reportedly have been mined and reseeded with mines, but lightering activity is taking place.

37. There are a number of reasons why the mining program cannot be entirely effective against all of the target areas. Totally sealing off a coastline of some 650 miles would be a mammoth undertaking. All along the coast, small craft can be beached and directly offloaded, and these activities can go on during night periods, when surveillance capabilities are seriously degraded. Further, there have recently been reports that the Chinese may attempt to move junks from their southern port of Pei Hai into the unmined back channels north of Cam Pha. This water labyrinth may prove exceedingly difficult to close off altogether. On the other hand, barring an all-out and massive effort by Hanoi's allies, the quantities of imports which can be brought into North Vietnam by these means will remain fairly small.

Curtailing Coastal Shipping

38. Major transshipment points represent the only reasonable targets for accomplishing this goal. Frequent, repeated attacks on such targets would hamper coastal shipping to a significant degree. While it is true that effectively denying to the enemy the use of coastal waterways would place an additional burden on land lines of communication and the inland waterways, it is doubtful that such a burden would be unmanageable. The vast bulk of coastal shipping has traditionally been of low-priority goods, many of which would simply not be moved at all. Furthermore, in the last several years, the overall importance of coastal shipping to the economy -- and certainly to the war effort -- has declined, as more efficient inland means, such as, for example, the North-South pipeline, have been developed.

*Denying Free Movement on Inland Waterways
and Attack Watercraft*

39. North Vietnam's waterway system is relatively invulnerable to destruction or permanent disruption. While we have no means of judging what level of effort would be required to successfully interdict the movement of supplies on the many major waterways in North Vietnam, it seems a certainty that it would be far in excess of the total sorties now being flown and more mines than are presently being emplaced. The transshipment facilities targeted so far, while major ones, represent only a few of many and, in any case, if destroyed would soon be replaced with makeshift arrangements. Mining of the inland waters was tried, with relatively little success, during Rolling Thunder. The mines were detonated in simple sweeping operations, and traffic was little impeded. Watercraft are exceedingly difficult to destroy by air, as evidenced by the fact that pilots have thus far reported sighting about 5,800 during the current campaign but claim to have destroyed only about 1,100.

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*Reducing North Vietnam's Capability to Repair
Transportation Equipment*

40. This objective requires the targeting of railroad repair shops, vehicle repair facilities, plants near Hanoi producing tires and batteries, and several facilities related to the repair of watercraft.

41. The railroad repair shops probably represent the best targets, the destruction of which would considerably impair North Vietnam's ability to maintain its rolling stock. Strikes against the vehicle repair facilities would have little impact on the trucking situation. Throughout North Vietnam, there are small workshops where truck repairs can be made. Strikes against the tire and battery factories would mean little to Hanoi, imports being the only significant source for such items. With the ports mined and large vessels denied the use of the coastal waterways, it is difficult to see much value in directing strikes at ship maintenance facilities. The numerous small boats that will continue to move within North Vietnam (almost regardless of the level of the interdiction effort) do not require maintenance yards.

Destroying War Stocks

42. During the earlier bombing campaign of 1965-68, the North Vietnamese emptied their major stockpiling facilities very quickly after the bombing began and dispersed their stocks widely in small, well concealed depots. The initial strikes at the beginning of Operation Linebacker probably found some of the larger stockpiling facilities well-stocked and may have done considerable damage. Since these installations have now almost certainly again been emptied, however, it is doubtful that a further concentration of effort on them is worthwhile.

43. As indicated earlier in this memorandum, Hanoi's stockpiling philosophy is a very conservative one; military stocks are very large in the aggregate, and the stockpiles are well dispersed throughout the country.

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44. At the beginning of 1972, the Communists launched their annual dry season "General Transportation Offensive" in southern Laos. Facilitated by a considerable road construction effort and restructured logistic apparatus, very large quantities of supplies were moved from North Vietnam through the Laos Panhandle into Cambodia and South Vietnam. Also, new roads were constructed through the DMZ, and substantial stockpiles were amassed in and near the battle areas.

45. The unprecedented supply campaign in the Laos Panhandle during the 1971/72 dry season (October-May) -- combined with the heavy use of the DMZ roads since March -- resulted in record supply deliveries to South Vietnam and allowed the enemy to establish substantial stockpiles sufficient to support their offensive in South Vietnam for a number of months. Furthermore, the resupply and repositioning of stockpiles continue.

46. To increase the effectiveness of air strikes, the bombing of storage areas would, at the least, have to be more systematic and repetitious than is presently the case. US attacks would have to keep pace with the enemy's dispersal program. However, attacks against storage facilities already represent over 10% of the total, and a more concentrated effort would mean an even greater imbalance in the program -- with very questionable chances of success.

*Disrupting the North Vietnamese
Petroleum Distribution System*

47. There is little question that petroleum represents the most critical commodity facing the North Vietnamese in pursuit of their war aims. Traditionally, they have imported an average of about 1,000 tons per day, mainly by sea; of this, we estimate that direct military requirements at the present rate of expenditure are about 330 tons daily. Strikes against petroleum storage facilities thus far have reduced the capacity of North Vietnam's principal petroleum storage facilities from 68,000 to less than 37,000 metric tons. Dispersed storage -- both tanks and drums -- has not been seriously affected, however, and the petroleum supply situation should be eased with completion of the new pipelines between China and North Vietnam and supplemental shipments by truck or rail sent from China.

48. While fixed storage facilities are reasonable targets, those that have yet to be struck probably contain significantly smaller quantities of petroleum than normal, and the loss of petroleum per unit of storage capacity destroyed will continue to decline.

49. Neither of the principal storage terminals at Hanoi or Haiphong appear now to be worthwhile targets. Most or all of the petroleum remaining at those terminals after the mid-April bombings probably has been removed, and there are only four tanks of 500 tons and larger capacity remaining at Hanoi and three tanks of 600 tons and larger capacity at Haiphong. Of the other principal terminals, Nguyen Khe and Ha Gai storage sites appear to have sufficient storage capacity to warrant attack. Both of these sites, however, contain hardened and/or hidden tanks that survived attacks during Rolling Thunder.

50. There were more than 200 dispersed tanks in North Vietnam at the beginning of 1972. Bombing of these targets has been reported by pilots as difficult to impossible, and they may still represent as much as 84,000 tons of storage capacity available to Hanoi.

51. The real issue, then, for any future targeting is what may be done to prevent the North Vietnamese from rebuilding stocks. It is unlikely that any bombing program *per se* would be entirely effective in depriving North Vietnam of imports of petroleum. However, continued denial of seaborne imports of petroleum, together with sustained bombing of truck and rail traffic, of the new pipeline segments between Hanoi and Dong Dang, and of dispersed storage sites along the pipeline right-of-way, would probably yield better results than continued bombing of petroleum storage sites elsewhere in North Vietnam.

Destroying Major Power Facilities

52. This objective involves trying to eliminate the major power sources for Hanoi and Haiphong and other industrial complexes elsewhere in northern North Vietnam. These attacks may have a great

psychological impact on the populace but will have only an indirect impact on the North Vietnamese ability to wage war.

53. The targets struck so far have been judiciously selected and the bombing thus far well-executed. Attacks against powerplants have put out of commission about 70% of North Vietnam's total of 260,000 kilowatts of generating capacity. In virtually every case, North Vietnam's major powerplants have been damaged during a single raid of only a few planes. In contrast, it took over two years to do comparable damage during Rolling Thunder.

54. The cumulative impact of bombing North Vietnam's electric power facilities is being felt primarily in the industrial sector. Power shortages by mid-June undoubtedly had shut down a large part of modern and local industry.

55. In addition to the electric power facilities, the bombing thus far has included strikes against other economic targets. While there have been far fewer strikes against manufacturing installations than during Rolling Thunder, the targets struck thus far rank among the most important in the modern sector of industry. The list includes the Thai Nguyen Iron and Steel Combine, North Vietnam's only iron and steel combine and the largest single industrial complex in the country; the Nam Dinh Textile Plant and the Viet Tri Chemical Complex, the largest such facilities in North Vietnam; the Haiphong Cement Plant, North Vietnam's only significant producer of cement; and the Hon Gay Coal Processing Plant, second largest of the two main coal-grading plants. No large-scale efforts to repair damage to these facilities have yet been observed.

56. Some of the bombing in the southern part of the country has included targets of minor economic importance, such as the Phu Ly Sugar Refinery and the Vinh Wood Processing Plant. But, in the main, the very restricted targeting of the economy thus far has seemed sound.

57. Whether or not any of the bombing will have a significant psychological effect remains to be

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seen. The regime cannot but be impressed with the results of the bombing thus far. For example, use of "smart" bombs has made the current program against electric power extremely effective. The Thac Ba hydroelectric powerplant, which represents some 40% of total generating capacity in the country, was severely damaged in only two strikes with only nominal attendant destruction in the vicinity. One strike against the Thai Nguyen thermal powerplant inflicted damage comparable to that requiring 10 strikes under Rolling Thunder. The Thanh Hoa thermal powerplant suffered nearly total destruction in one strike, compared to Rolling Thunder strikes numbering six in 1965, four in 1966, and one in 1967.

58. In the final analysis, since North Vietnam is essentially a subsistence economy, the loss of industrial production will probably have almost no impact on the great mass of this agrarian society. The small element of the population directly affected would probably not be sufficient, or disposed or able, to persuade the regime to stop the war.

Denying USSR/PRC Access to Airfields

59. This objective, if attained, would prevent either the USSR or the PRC from initiating a major aerial resupply effort. The targets which would have to be destroyed to accomplish this goal are the major airfields around Hanoi and Haiphong. They are big, are not located near civilian populations, and include associated facilities (hangars, revetments, maintenance and storage depots, and taxiways) that are also vulnerable and usually exposed. However, experience during Rolling Thunder does not bode well for a successful, sustained interdiction of these fields. During 1966-67, all of North Vietnam's six major airfields were repeatedly struck, but all continued to support some level of traffic. At Phuc Yen, for example, following heavy strikes in October 1967, the runway was sufficiently repaired within three days to allow at least limited MIG operations.

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*Disrupting Major Communications and Command
and Control*

60. There are six high-priority targets in this category, including five high-frequency (HF) point-to-point transmitting facilities and one radio transmitting point/antenna array (at Me Tri) which handles all of Hanoi's domestic and international propaganda broadcasts.

61. On point-to-point broadcasting (which services military and Party command and administrative requirements), aside from the five HF facilities specifically noted, there are at least 17 others of considerable (perhaps equal) importance to North Vietnam's domestic and international telecommunications. Even if all these facilities were bombed, the North Vietnamese could probably take almost immediate steps to prevent anything more than temporary, localized disruption of command communications Hanoi regarded as critical. ("Communications," as used here, does not include voice radio broadcasts, which are discussed in the next paragraph.) In addition to its major fixed radio installations, North Vietnam has available several hundred small HF radio communications facilities, almost all of which are readily transportable and easily concealed from detection by air. The North Vietnamese also operate and maintain an extensive wireline system, augmented by a rapidly expanding microwave radio relay network. Together, these provide North Vietnam with a telecommunications base almost impossible to eliminate. The availability of these alternate facilities almost certainly assures that, except for brief and probably localized disruptions, the flow of what the North Vietnamese leadership considered essential military, economic, and administrative traffic could be sustained. The loss of the five primary HF sites, however, would obviously create some measure of confusion and adversely affect the efficiency of Hanoi's overall communications network until the sites were repaired or fully replaced. Full repair or replacement, furthermore, would involve considerable cost and probably at least some equipment not now available in North Vietnam.

62. The picture is somewhat different with respect to domestic and international voice radio broadcasts, i.e., AM broadcasts on both standard

and short wave.* The Me Tri transmitter complex and antenna array services the domestic and international output of Radio Hanoi, Liberation Radio (i.e., the ostensible voice of the NLF/PRG), and the Voice of Sihanouk and of the Pathet Lao. Me Tri is not a part of Hanoi's command and control (i.e., administrative net) communications system. A severe, successful attack on Me Tri would silence for a period of time Radio Hanoi, Liberation Radio, and the Sihanouk and Pathet Lao radios. Through various types of jury rigs, propaganda/voice output coverage of some local areas could probably be resumed within several hours or a few days (e.g., within Hanoi itself, Radio Hanoi's domestic output could probably be piped over the electrical systems in the way that many college or university radio stations in the United States reach their specialized audience in their institutions' dormitories). Severe damage to the Me Tri complex, however, would deprive the North Vietnamese of their principal domestic and international propaganda outlet for both overt and covert (i.e., clandestine) radio broadcasting for a considerable period of time.

* We would note that without North Vietnam's radio broadcasts, the US Government would lose one of its main windows for observing the reactions and attitudes of the Hanoi government.

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